REMARKS

In accordance with the foregoing, claims 6 and 7 have been amended as suggested by the Examiner and discussed below in relation to item 2 of the Action and various other claims have been amended to correct typographical and minor errors therein. No new matter is presented. Approval and entry of the amended claims are respectfully requested.

STATUS OF CLAIMS

The first Office Action of April 20, 2001 had rejected all of the pending claims 1-26 under 35 USC § 112, ¶2 for indefiniteness, along with asserting numerous objections to these claims. The response to that Action, filed January 11, 2002, successfully overcame most of those rejections.

In the present, FINAL Office Action, claims 15-26 are allowed. Further, claims 5, 7, 8, 10 and 13 are indicated to be allowable if suitably rewritten to overcome § 112, ¶ 2 rejections of this current, final Office Action and so as to be placed in independent form.

Claims 1-4, 11, 12, 14 and 27-28 are rejected.

REASONS FOR ALLOWANCE

Item 9 of the present Action, similar to item 10 of the first Action, provides the Examiner's statement of reasons for the indication of allowable subject matter as to claims 5, 7 and 10, 13 and 15. (While the rejection of claim 8 has been withdrawn and that claim is now allowed, no "reasons" are set forth in explanation of the allowability of claim 8.)

ITEM 2: REJECTION OF CLAIMS 6 AND 7 UNDER 35 USC § 112, ¶ 2

Applicants agree with the Examiner's suggestions for corrections to claims 6 and 7 and have implemented same in the twice amended claims 6 and 7 herewith.

The Examiner's careful attention to the claims and helpful suggestions for improving same are greatly appreciated.

ITEM 4: REJECTION OF CLAIMS 1-4, 11, 12, 14 AND 27-28 FOR OBVIOUSNESS UNDER 35 USC § 103(a) OVER TANAKA IN VIEW OF SEKI AND KIMURA

The Examiner has now correctly cited Seki et al. -- rather than Tadashi et al., incorrectly cited in the first Office Action. In item 4, the Examiner seeks to interpret and rely on paragraphs 0010 through 0015 and the section headed "Effect" of Seki et al., based on a machine translation of the reference.

Applicants respectfully object to the reliance on the machine translation of Seki et al. since the same is difficult, if not impossible, to understand with any degree of clarity, leading applicants, as well, to question the accuracy of the Examiner's interpretation of same and reliance thereon in support of the rejection. For example, item 4 of the Office Action, at page 2, lines 7-12, asserts that Seki discloses embodiments "in which apparently `both glass substrates are sealed by differential pressure of kiln internal pressure and the pressure between the two substrates'..." The Examiner appears to be speculating as to the disclosure of Seki, in adopting the "apparently..." term in describing the disclosure of the reference being relied upon. In fact, as shown in the following, the Examiner is respectfully submitted to have misunderstood the disclosure of Seki -- a mistake arising, no doubt, from reliance on the machine translation.

Moreover, the document received with the Office Action comprising the machine translation, copy attached, does not correlate readily to the Examiner's references to same. In the attached copy, the pages have been numbered 1 through 10, in handwriting, at the bottom of each page. Note that pages 2-4 include paragraphs 0001 through 0012, page 5 bears a paragraph 0003 and page 6 has the "Effect" paragraph -- whereas pages 7-9 have paragraphs 0006 through 0018.

Applicants respectfully submit that the present Action is defective, as having been made FINAL, on the basis of the defective translation of the reference to Seki et al. and in light of which the finality should be withdrawn.

Seki et al. was relied upon in the first Office Action for the identical reasons as are set forth in the sentence spanning lines 4-7 of item 4 of the present Action. The present Action, however, in the balance of item 4, newly relies upon paragraphs 0010 through 0015 and the section headed "Effect" of Seki et al. -- constituting new grounds of rejection not occasioned by any amendments of the claims in the last response and rendering the FINAL status premature.

To clarify the disclosure of Seki, a copy of the drawings of Figs. 1 to 5, enlarged to facilitate understanding same, are attached. To better clarify the disclosure of Seki, the

embodiments of Seki described in paragraphs 0010 through 0015 and "Effects" are discussed below.

FIRST EMBODIMENT OF SEKI

The first embodiment is described in Seki paragraphs 0006 through 0013 and shown in Figs. 1 and 2. The glass substrates A and B are "attached in the installation device 1", line 1 in paragraph 0010, which is believed to mean that the substrates A and B are arranged within the installation device 1 as shown in Figs. 1 and 2, where the space between the substrates A and B is adjusted by rotation of the drive rods 5 by the motors 7 (shown in Fig. 1) which make the setters (holders?) 4 for setting (holding?) a substrate move up and down. (Paragraph 0006, lines 2 through 8)

The description in paragraph 0011: "drive a motor 7, drop the drive rod 5, surface glass-substrate A is made to stick by pressure on tooth-back substrate B" is believed to mean that the drive motor 7 drops the drive rod 5 until the substrate A presses against substrate B thereby to stick the surface glass-substrate A to the tooth-back substrate B (back substrate B). The term "by pressure" in the above machine translation, however, does not mean a gaseous pressure produced by a pressure difference but, rather, a force produced by mechanical pressing, as described above.

In short, there is no description in Seki as to the first embodiment containing any reference to any difference in air pressure between the interior space between the substrates A and B and the exterior thereof. Instead, the mechanical pressure exerted on the substrates A and B in the first embodiment of Seki is supplied through motion of the rods 5 produced by the motors 7.

Furthermore, as described below, both the second and third embodiments of Seki disclose only that increasing the pressure in the kiln (and thus on the exterior of the substrates A and B) to a level higher than the pressure within the interior of, and thus between, the substrates A and B causes a force to press the substrates A and B together.

SECOND EMBODIMENT OF SEKI

The second embodiment of Seki is described in paragraphs 0014 through 0015. The second embodiment is very similar to the first embodiment; fundamentally, the difference

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between those two embodiment is that "the degasifying processing and exhaust air processing" are performed "at another process" in the second embodiment.

Paragraph 0014, lines 7-10, recites:

> Then, using a change-over valve V4 as open using a change-over valve V1 as close, N_2 gas etc. is supplied to near-the atmospheric pressure in kiln, and like the above-mentioned, glass substrates A and B are sealed and it considers as a panel. And evacuation of the inside of a panel is carried out with evacuation equipment during a cooling time or after the completion of cooling, using a change-over valve V3 as open....

It is significant that the pressure in the space between the glass substrates A and B, at the time of introducing N_2 gas etc., into the kiln (furnace) is not described. Furthermore, as the glass substrates A and B are sealed together after the introduction of gas thereinto -- and thus at a subsequent time to that assembly stage described in paragraph 0014 -- there will be no significant difference, if any, between the gas pressure in the interior, and the gas pressure in the exterior, of the substrates A and B -- i.e., the substrates are not sealed at this stage and, accordingly, there is no gas pressure difference between the pressure of gas in the kiln and the pressure of gas in the interior space between the substrates A and B.

THE PARAGRAPH HEADED "EFFECT" OF SEKI

Item 4, lines 9-11, at page 2 of the Office action describes that "both glass substrates are sealed by differential pressure of kiln internal pressure and the pressure between the two substrates." This is not disclosed in relation to the first or the second embodiment, as described above. Instead, this description seems to relate to paragraphs 0016-0017 which describe the third embodiment.

TRANSLATION OF PARAGRAPHS 0016-0018 OF SEKI

In the following, a translation of paragraphs 0016-0018 is set forth, in which an effort has been made to avoid changing any words of the machine translation to the extent possible; however, where that is deemed unavoidable, words and phrases are set forth in parentheses to indicate where such changes have been made.

TRANSLATION OF PARAGRAPH 0016 OF SEKI

Paragraph 0016: The third embodiment is shown below. Like the first embodiment aforementioned, after the vacuum level within the kiln [furnace] has act to a predetermined degree of vacuum, exhausting within the kiln, and degassing the both substrates A and B, the temperature within the kiln is raised by further heating to 400~500°C where the sealing agent 20 will be melted. Meanwhile the heating or after the heating, a discharge gas, such as neon gas for example, is introduced in the kiln from a discharge gas cylinder 15 by a operation of closing the selector valve V_1 and opening the selector valve V_2. After the completion of the introduction of the gas into the kiln and the heating both substrates A and B, the front substrate A is sealed [contacted and pressed] to the back substrate B like aforementioned way [or described above: there is no concrete indication, but the aforementioned way may be the way shown in the first embodiment from the context.], where both substrates in this sealing process are pressed and formed into a panel and simultaneously the discharge gas is introduced [note: it is not clear where the gas is introduced but the discharge gas will be introduced into the panel from the next sentence.]. In this case, the chip spool 21 and the piping 12 and the like are not necessary.

TRANSLATION OF PARAGRAPH 0017 OF SEKI

Paragraph 1017: In addition, since the temperature of a discharge gas is high, the pressure of the discharge gas is preferably higher 2.4 times, for example at 450°C, than the last pressure (the pressure at a ordinary temperature) [an ordinary temperature may be a room temperature.] After the discharge gas has been introduced into the panel by the same way aforementioned, it [the panel] is cooled at the cooling rate of 1~10°C/minute.

TRANSLATION OF PARAGRAPH 0018 OF SEKI

Paragraph 0018: In the third embodiment, it is also desirable to support the substrates A and B by supporting members 22 made from the material, such as glass of low melting point having a little different composition of mixture, which melts at a higher temperature than that [melting temperature] of the sealing agent 20, and to melt the supporting members 22 during the scaling process (400~500°C) for sealing the both substrates A and B to carry out a panel, and then the internal pressure within the kiln is increased to a higher pressure than that of a pressure in the panel to press the both substrates A and B and at the same

> time a discharge gas is introduced into the panel. In this case, each setter 3 for setting the back substrate in the installation device 1 should be mounted to the slide guide 2 so that the setter 3 can slide along the slide guide 2. Furthermore, though the each embodiment is explained as the embodiment in the hatch processing manner, it can be processed in a manner of continuous or intermittent conveying in a furnace a muffle in which the glass substrates are placed.

(Emphasis added)

Please note that in paragraph 0018, underlining has been added to indicate portions corresponding to the Examiner's quotations in the Office Action.

It is important to note that the increasing of the internal pressure of the kiln results in the difference in pressure between the interior and exterior of the panel in Seki.

DIFFERENCES BETWEEN THE PRESENT INVENTION AND SEKI

As described above, in Seki, a differential pressure is produced not by lowering a pressure in the discharge space, as performed in accordance with the present invention and recited in claim 1, but rather by increasing the internal pressure within the kiln.

TRAVERSE OF REJECTION OF OFFICE ACTION IN ITEM 4 ON CLAIMS 1-4, 11, 12, 14 AND 27-28

The Examiner's contention in Item 4 at lines 7-11 on page 2 of the Office Action, that paragraphs 0010 through 0013 and paragraph 0014 through 0015 disclose embodiments in which "both glass substrates are sealed by differential pressure of kiln internal pressure and the pressure between the two substrates", accordingly is not relevant. As clarified above, Seki discloses only that the internal pressure within the kiln is increased to a higher pressure than that of a pressure in the interior of the panel, to press the substrates A and B together. By contrast, in accordance with the invention as claimed, the pressure in the discharge space is lowered, relatively to a pressure on an exterior of the pair of substrates, by exhausting the discharge space.

It is submitted that these differences between the present invention and Seki clearly, patentably distinguish the present invention from Seki and, thus, the rejection should be

withdrawn.

ITEM 5: REJECTION OF CLAIMS 29 AND 30 FOR OBVIOUSNESS UNDER 35 USC § 103(a) OVER TANAKA, SEKI AND KIMURA TAKEN FURTHER IN VIEW OF KANAKA [sic. -- NAGANO]

Applicants' counsel contacted the Examiner on March 22, 2002 to request more specific identification of the newly cited Kanaka reference. The Examiner explained that he had intended to cite the Nagano reference USP 5,207,607, of record, and confirmed same in a communication mailed March 27, 2002.

Nagano et al., relied upon in the prior Action, was discussed at length and distinguished in the prior response. However, the Final Office Action is now relying on a further portion of the Nagano disclosure relating to Figs. 15 and 16, not addressed in the prior response. Applicants submit that this further portion of the reference is no more pertinent than the portions previously relied upon and that the reference is readily distinguished.

The Examiner's contentions in the second half of the paragraph of item 5, as to what "would have been obvious...", are somewhat difficult to comprehend:

i. The initial contention is that: "It would have been obvious...that the initial distance between the glass plates can be maintained by relying upon a leak clearance between the glass sealant and the back panel...."

ii. The Examiner then contends that: "it was well known at the time of applicants' invention to [sic.] in the art to provide a protuberance on the seal member to increase the spacing. After the sealant is deformed, it is clearly obvious to continue he evacuation through the exhaust tube to maintain the low atmosphere in the device."

Nagano et al. has no teaching of any "leak clearance" between the sealant 6 and either of the substrates 1 and 3 -- i.e., "a leak clearance...between the frame-and the shaped sealant and at least one of the pair of substrates..." as recited in claim 29 or a "leak clearance between the seal glass layer and the substrate..." as recited in claim 30. Moreover, a "leak clearance" is not relied upon to maintain any "initial distance between the glass plates...."

There is no teaching or disclosure in any of Figs. 6-16 or in any of Figs. 17-19, of any exhaust tube. Indeed, glass tube 7 shown in prior art Figs. 1-3 is described as presenting many inconveniences (col. 1, line 64 - col. 2, lines 1 and 2) prior art Fig. 5 expressly employs a port 2

without any glass tube -- but the structure of Fig. 5 is characterized as presenting yet other difficulties with respect to closing of the port 2 and to which the Nagano et al. invention relates.

Particularly, Nagano, in Figs. 8-14, teaches use of a blocking rod 27 mounted on the interior surface of the rear panel 3 and aligned with and extending through the port 2, with a space separating the rod 27 from the edge of the post 2 through which the interior of the panel is evacuated. Nagano also teaches the use of glass 6, in a hardened state -- and ultimately to be melted and used as a sealing material -- to space the panels 2 and 3 apart and thereby maintain an open area above the partitions 5 to facilitate the exhausting step.

Figs. 15 and 16, as a modification to the foregoing, uses a tablet 28 which is of a height less than the spacing between the panels 1 and 3 so as to provide an open gas port 2 for exhausting the interior space. As explained at col. 6, when the desired vacuum level is achieved, the evacuation is discontinued and a discharge gas is introduced into the tank 21 (see Fig. 6) in which the panel is disposed, so as to fill the enclosure. The temperature then is raised so as to soften the glass 6 and likewise the blocking element 27 or 28, thereby to seal the panels about their respective peripheries and to seal the port 2.

Accordingly, there is not any teaching or suggestion in Nagano of a "leak clearance" associated with the glass 6; to the contrary, the clear teaching is that gas within the enclosure is exhausted through the exhaust port 2. Further, there is no teaching in Nagano to employ an exhaust tube -- and, to the contrary, the reference clearly "teaches away" from the use of an exhaust tube.

Nagano thus refutes the interpretation the Examiner seeks to place upon it, as to teaching or suggesting the leak clearance recited in dependent claim 29/27 and independent claim 30 or the use of an exhaust tube (claim 30).

In fact, Nagano is distinguishable on even broader bases, as set forth in the prior response at page 15, and which is incorporated herein by reference.

It furthermore is noted that this rejection of item 4 relies upon Seki and which has been shown to be misunderstood by the Examiner and not supportive of the rejection of item 4; it follows that the prior art combination of item 5, as well, is defective in light of reliance on Seki.

ITEM 6: REJECTION OF CLAIMS 6 AND 9 UNDER 35 USC § 103(a) OVER TANAKA, SEKI ET AL. AND KIMURA TAKEN FURTHER IN VIEW OF ITOH ET AL.

This rejection was raised likewise in item 6 of the prior Action and was traversed at page 18 of the prior response and that the traversal is incorporated herein by reference; likewise, Seki et al. has been shown to be deficient and thus the prior art combination of item 6 is defective.

ITEMS 7 AND 8: ALLOWABLE AND ALLOWED CLAIMS

The allowance of claims 15-26 in item 8 and the indicated bases of allowability of claims 5, 7, 8, 10 and 13 are acknowledged and greatly appreciated.

The dependent claims have not been rewritten to independent form in view of the traverse of the rejections of the respective independent claims and believed allowability thereof, as set forth in the foregoing.

CONCLUSION

It is respectfully submitted that the pending claims distinguish patentably over the art of record and, there being no other objections or rejections, that the application is in condition for allowance, which action is earnestly solicited.

If there are any additional fees associated with filing of this Amendment, please charge the same to our Deposit Account No. 19-3935.

Respectfully submitted,

STAAS & HALSEY LLP

Date: July 11, 2002

By: _____
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By: _____
Date: _____

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

Please AMEND the following claims:

1. (AS ONCE AMENDED) A method of manufacturing a gas discharge panel having a pair of substrates sealed together with a sealant and defining a discharge space therebetween, comprising :

forming the sealant in a frame-shape on at least one of the pair of substrates, and stacking said substrates, one upon the other via the sealant;

lowering a pressure in the discharge space between the pair of substrates, relatively to a pressure on an exterior of the pair of substrates, by exhausting the discharge space, while heating and thereby melting the sealant ;

solidifying the sealant so as to fixedly join the pair of substrates with the discharge space therebetween;

removing an impurity in the discharge space; and

filling a discharge gas into the discharge space.

2. (AS ONCE AMENDED) A method of manufacturing a gas discharge panel as recited in claim 1, wherein the lowering of the pressure further comprises:

exhausting the discharge space when the sealant reaches a predetermined melting temperature thereof ; and

pressing the sealant by establishing a predetermined low pressure in the discharge space so as to define a gap between the pair of the substrates.

3. (AS ONCE AMENDED) A method of manufacturing a gas discharge panel as recited in claim 1, wherein, in the second step, the exhausting of the discharge space for lowering the pressure in the discharge space between the substrates and the heating for melting the sealant are begun simultaneously.

4. (AS ONCE AMENDED) A method of manufacturing a gas discharge panel as recited in claim 1, further comprising:

providing separator walls on at least one of the substrates, a height of said separator walls defining a height of the discharge space when the pair of substrates compresses the

sealant.

5. (AS ONCE AMENDED) A method of manufacturing a gas discharge panel as recited in claim 1, wherein a non-continuous barrier wall is provided beforehand in a vicinity of an interior of the sealant so as to prevent an inward invasion of the melted sealant.

6. (TWICE AMENDED) A method of manufacturing a gas discharge panel as recited in claim 1, wherein:

the forming of the sealant further comprising forming a plurality of said frame-shaped sealants on said one of said substrates; and

carrying out the lowering, solidifying, removing and filling for said plurality of [ac] frame-shaped sealants and respective plurality of discharge spaces formed within said frame-shaped sealants.

7. (TWICE AMENDED) A method of manufacturing a gas discharge panel as recited in claim 6, wherein said plurality of discharge spaces are provided with respective through holes in adjacent [a] relationship, so that said exhausting and said discharge gas filling processes are carried out via a pipe connected commonly to each of the respective through holes.

8. (AS ONCE AMENDED) A method of manufacturing a gas discharge panel as recited in claim 1, wherein peripheral portions of said pair of substrates are pinched together with temporary fixing clips.

9. (TWICE AMENDED) A method of manufacturing plural gas discharge panels, each having a respective discharge space, between a pair of substrates, each panel sealed together with a sealant frame, comprising the steps of :

forming a plurality of sealant frames, on a first surface of a first substrate opposing a second substrate and stacking said first substrate onto said second substrate via the plurality of sealant frames, wherein each of the substrates has a plurality of cutting lines defining the plural gas discharge panels, formed with respective sealant frames so as to enclose respective discharge spaces;

lowering [are] an internal pressure of each of the plurality of discharge spaces relatively

to a pressure on an exterior of each of the pair of substrates so as to press the pair of the substrates together and to fix a size of the discharge spaces between the pair of the substrates and heating and thereby melting the plurality of sealant frames;

solidifying the plurality of sealant frames, once melted, so as to fix the pair of the substrates and form the plurality of discharge spaces between the pair of substrates;

removing impurities in the discharge spaces;

filling a discharge gas into the discharge spaces and sealing the discharge spaces; and

cutting the pair of the substrates along the cutting lines into a plurality of smaller substrates so as to form a plurality of individual said gas discharge panels.

10. (AS ONCE AMENDED) A method of manufacturing a gas discharge panel as recited in 9, wherein said plurality of discharge spaces are provided with a plurality of respective conduction pipes in adjacent relative positions to each other, each extending from an exterior of a respective gas discharge panel to the respective discharge space thereof, and so that said exhausting and said discharge gas filling processes are carried out via a pipe connected commonly to the plurality of conduction pipes.

11. (TWICE AMENDED) A method of manufacturing a gas discharge panel comprising a pair of substrates opposed to each other, one of the substrates having a plurality of electrodes on a inner surface thereof so as to produce a discharge with adjacent electrodes and the other of the substrates having on an inner surface thereof fluorescent materials of a plurality of different colors for emitting fluorescences stimulated by the discharges and a plurality of separator walls formed in a predetermined pattern separating said fluorescent materials, comprising :

forming a seal glass layer along a periphery of the other substrate, of a height greater than a height of said separator walls ;

positioning the pair of substrates, in opposed relationship and separated by a discharge space of a predetermined interval therebetween, in a vacuum-heating furnace;

exhausting the discharge space between the pair of opposed substrates ; and

heating said [said] seal glass layer until said seal glass layer melts while maintaining the low pressure in the discharge space by said exhausting.

12. (AS ONCE AMENDED) A method of manufacturing a gas discharge panel

comprising a pair of substrates having respective pluralities of electrodes thereon and being disposed in opposing relationship with a discharge space therebetween, comprising :

forming a seal-glass layer along a periphery of one of the substrates;

positioning the pair of substrates, in opposed relationship and separated by a discharge space of a predetermined interval therebetween, in a vacuum-heating furnace;

exhausting said discharge space via a leak clearance between the seal-glass layer and the substrate while disposed with a furnace and which maintains a predetermined temperature within the furnace; and

lowering the pressure in the discharge space between the pair of the substrates by exhausting same via a conduction pipe, connected to a through hole previously provided in a portion of the other substrate, while the temperature within the furnace is raised to a melting temperature of said seal-glass layer to seal the substrates.

13. (AS ONCE AMENDED) The method of manufacturing a gas discharge panel as recited in claim 12, wherein a pressure within the furnace and exterior of the pair of substrates is raised at least once after lowering the pressure exterior of the pair of substrates before melting said seal-glass layer.

14. (AS ONCE AMENDED) The method of manufacturing a gas discharge panel as recited in claim 12, further comprising lowering the pressure via a seal-head connected to the conduction pipe.

15. (AS ONCE AMENDED) A method of manufacturing a gas discharge panel comprising a pair of substrates defining a discharge space therebetween and having a plurality of separator walls on at least one of the pair of substrates, comprising :

forming a sealant in the shape of a frame on one of the pair of substrates

stacking the one substrate onto the other substrate;

arranging a formed- glass-frit in a vicinity of and aligned with a through hole in one of the substrates;

heating the pair of substrates so as to raise a temperature of the pair of substrates and exhausting gas from, and lowering a pressure in, a space surrounding the pair of the substrates so as to remove any impurities in the discharge space between the substrates;

melting the sealant;

forming said discharge space to a height determined by a height of the separator walls by deforming the sealant;

cooling the pair of the substrates so as to solidify the sealant;

filling the discharge space with a discharge gas introduced through the through hole in the panel; and

sealing the through hole after filling the discharge space with the discharge gas .

16. (TWICE AMENDED) The method of manufacturing a gas discharge panel as recited in claim 15_1 wherein the sealant frame is formed of a height greater than a height of the separator walls, clips for pinching and affixing the pair of stacked substrates are located so as to press together respective central portions of the substrates within a vicinity of regions where the separator walls are to engage the other substrate,[,] bending the central portions of the substrates in an inward direction toward the discharge space relatively to the peripheries thereof, spaced apart by the sealant frame.

17. (TWICE AMENDED) The method of manufacturing a gas discharge panel as recited in claim 15_1 wherein [in the fifth step] the deforming of the sealant is caused by a force produced in a direction toward the discharge space from an exterior of both of the pair of substrates by maintaining a pressure in the exterior of the pair of substrates higher than a pressure in the discharge space between the substrates.

18. (TWICE AMENDED) The method of manufacturing a gas discharge panel as recited in claim 15_1 wherein the height of the discharge space is determined by closing a portion of a conduction path, from the discharge space to the exterior of the pair of the substrates, so as to provide a uniform pressure-difference between a lower pressure in the discharge space between the substrates and a relatively higher pressure on the exterior of the pair of the substrates.

19. (TWICE AMENDED) The method of manufacturing a gas discharge panel as recited in claim 15,[,] further comprising, while heating the pair of substrates, exhausting gas from the exterior of the pair of the substrates when the sealant reaches a vicinity of a temperature at which degassing becomes active and is ended when the sealant adheres to the substrate.

20. (AS ONCE AMENDED) The method of manufacturing a gas discharge panel as recited in claim 15, wherein a conduction pipe is connected to the through hole, a seal-head operable to exhaust the discharge space via the conduction pipe is connected to the conduction pipe, and exhausting the discharge space is carried out via the conduction pipe and the seal-head after the sealant adheres to the substrate.

21. (AS ONCE AMENDED) The method of manufacturing a gas discharge panel as recited in claim 15, wherein, while melting the sealant, raising the pressure in the exterior of the pair of substrates to a level of pressure at which a bubble existing in the sealant does not increase in size.

22. (TWICE AMENDED) The method of manufacturing a gas discharge panel as recited in claim 20, wherein, after the sealant adheres to the substrate, raising the pressure on the exterior of the pair of substrates [is raised] to a level of a pressure at which a bubble existing in a sealant does not increase in size.

23. (TWICE AMENDED) The method of manufacturing a gas discharge display panel as recited in 15, wherein, in the fourth step, melting the sealant [is melted] at a temperature below a temperature at which softening of the sealant begins, so as to prevent a bubble in the sealant from increasing in size.

24. (TWICE AMENDED) The method of manufacturing a gas discharge display panel as recited in 15, further comprising connecting a conduction pipe to the through-hole, [and] connecting a seal head, available to exhaust the discharge space, to the conduction pipe after the sealant is solidified and cooled and introducing a discharge gas through the conduction pipe and seal head into the discharge space.

25. (AS ONCE AMENDED) The method of manufacturing a gas discharge display panel as recited in 20, further comprising using a heater provided in the seal-head to heat and melt a part of the conduction pipe after introducing the discharge gas into the discharge space via the conduction pipe, so as to seal the discharge space.

26. (AS ONCE AMENDED) The method of manufacturing a gas discharge display panel as recited in 25, wherein an ambient pressure on an exterior of the pair of substrates and the part of the conduction pipe to be melted is raised to a higher pressure than that in the discharge space when the part of the conduction pipe is melted.

27. (AS NEW) A method of manufacturing a plasma display panel comprising a pair of substrates having a discharge space therebetween and sealed with a sealant, comprising:

forming the sealant in a frame-shape and disposing same so as to extend between the pair of substrates;

exhausting the discharge space through a conduction pipe, secured to at least one of the substrates and communicating with the discharge space;

heating and thereby melting the sealant while exhausting the discharge space through the conduction pipe so as to lower the internal pressure within the discharge space, relative to an external pressure on the exterior of the substrates, such that the sealant, while melting, is compressed by the external pressure on the pair of substrates, sealing the pair of substrates.

28. (AS NEW) The method of manufacturing a plasma display panel as recited in claim 27, further comprising:

after sealing the pair of substrates, heating the discharge space to a temperature lower than a melting point of the sealant and exhausting the interior of the discharge space via the conduction pipe, so as to remove impurities from within the discharge space and thereby purify same; and

filling the purified discharge space with a discharge gas via the conduction pipe.

29. (AS NEW) The method of manufacturing a plasma display panel as recited in claim 27, wherein a leak clearance is formed between the frame-shaped sealant and at least one of the pair of substrates and the exhausting of the discharge space is performed through both the conduction pipe and the leak clearance.

30. (AS NEW) A method of manufacturing a gas discharge panel comprising a pair of substrates opposed to each other, one of the substrates having a plurality of electrodes on a inner surface thereof so as to produce a discharge with adjacent electrodes and the other of the substrates having on an inner surface thereof fluorescent materials of a plurality of different colors for emitting fluorescences stimulated by the discharges and a plurality of separator walls

formed in a predetermined pattern separating said fluorescent materials, comprising:

forming a seal glass layer along a periphery of the other substrate, of a height greater than a height of said separator walls;

positioning the pair of substrates, in opposed relationship and separated by a discharge space of a predetermined interval therebetween, in a vacuum-heating furnace;

exhausting the discharge space between the pair of opposed substrates via a leak clearance between the seal glass layer and the substrate until said seal glass layer begins melting, to produce a low pressure therein relative to an exterior pressure on the substrates; and

heating said seal glass layer until said seal glass layer melts while maintaining the low pressure in the discharge space by said exhausting.

* NOTICES *

Field

[The technical field to which invention belongs] this invention relates to the manufacture technique of a plasma display panel.

[Translation done.]

* NOTICES *

The Japanese Patent Office is not responsible for any
damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] this invention relates to the manufacture technique of a plasma display panel.
[0002]
[Description of the Prior Art] Although various technique is proposed as the manufacture technique of a plasma display panel, there are the following as a typical thing. That is, the chip spool which is a glass tube for air supply and exhaust as open for free passage [first, while an electrode etc. is prepared in each opposite side of a surface glass substrate and a tooth-back glass substrate, a breakthrough is prepared in the lateral part of a surface glass substrate, and / with the aforementioned breakthrough] on the front face of this glass substrate is attached. And it is one [at least] opposite side of both the aforementioned glass substrates, and sealing agents, such as a low melting glass, are applied outside the aforementioned breakthrough. Then, both are fixed with restricted fixtures, such as a clip, in piles so that the electrode of both glass substrates may be countered and intersected perpendicularly, and by carrying out heating melting of the sealing agent at sealing kiln, the sealing unification of both the aforementioned glass substrates is carried out, and it considers as a panel.
[0003] While an air-supply-and-exhaust spool is next connected to the chip spool of the panel which carried out aforementioned] sealing unification, this air-supply-and-exhaust spool is opened for free passage possible [changeover to the bomb for discharge gases, and a vacuum pump], and it inserts in exhaust air kiln, and while the aforementioned panel is heated, evacuation of each interior of a panel is carried out to a predetermined degree of vacuum with a vacuum pump, and a degasifying is performed. Then, a discharge gas (Ne), for example, neon, an argon (Ar), xenons (Xe), or these mixed gas is enclosed with the interior of a panel to about 400-600 Torrs. If the aforementioned enclosure work finishes, a panel will be extracted from exhaust air kiln, the aforementioned chip spool will have been stopped, and it will consider as a predetermined plasma display panel.
[0004]
[Problem(s) to be Solved by the Invention] However, although it continues after sealing processing of both glass substrates at the evacuation inside a panel and enclosure work of a discharge gas is performed in the aforementioned conventional technique 100-200 micrometers [in which the aforementioned interior of a panel is substantially formed by the mating face of both glass substrates] since it is very a slit and a less than 100-200-micrometer septum exists in this opening (space), The exhaust air for a degasifying took time very much, and while the productivity was very bad, it had the technical probrem that exhausting became inadequate and the discharge-gas purity inside a panel became low.
Therefore, the 1st purpose of this invention is offering the manufacture technique of the plasma display which can exhaust the interior of a panel for a short time (degasifying). Moreover, by the aforementioned conventional technique, while the chip spool is required, you have to attach this chip spool in a surface glass substrate with a sufficient precision. Furthermore, the air-supply-and-exhaust spool which connects to a vacuum pump etc. the restricted fixture and the aforementioned chip spool which fix a surface glass substrate and a tooth-back glass substrate is also needed. That is, by the aforementioned technique, much time is needed for installation of about [needing many members] or these members, connection, etc. Therefore, the 2nd purpose of this invention is offering the manufacture technique of the plasma display which solves the aforementioned technical probrem by moreover enclosing the exhaust air inside a panel, and the discharge gas inside a panel very easily for a short time.
[0005]
[Means for Solving the Problem] To this invention, the manufacture technique of such a plasma display panel In order to attain the aforementioned purpose, in invention of a claim 1 The process which piles up a surface glass substrate and a tooth-back glass substrate so that it may have a predetermined spacing and the electrode may counter and intersect perpendicularly, The process which this piled-up glass substrate is located in kiln, and carries out evacuation of the inside of the concerned kiln under predetermined temperature, It consists of the process which carries out the temperature up of the inside of the concerned kiln to sealing temperature, and seals both glass substrates, a process which cools the inside of kiln and cools both glass substrates after glass-substrate sealing, and a process which supplies and encloses a discharge gas from the chip spool attached in the glass substrate of one of the above after the completion of cooling. The

process which piles up a surface glass substrate and a tooth-back glass substrate in invention of a claim 2 so that it may have a predetermined spacing and the electrode may counter and intersect perpendicularly, The process which this piled-up glass substrate is located in kiln, and heats the inside of the concerned kiln in an inert atmosphere following on the evacuation under predetermined temperature, The process which carries out the temperature up of the inside of the concerned kiln to sealing temperature, and seals both glass substrates, and the process which cools the inside of kiln and cools both glass substrates after glass-substrate sealing, It consists of a process which carries out evacuation from the chip spool which attached the space between glass substrates in the glass substrate of the above [either], and a process which supplies a discharge gas from the aforementioned chip spool, and is enclosed in the aforementioned space. The process which piles up a surface glass substrate and a tooth-back glass substrate in invention of a claim 3 so that it may have a predetermined spacing and the electrode may counter and intersect perpendicularly, The process which this piled-up glass substrate is located in sealing kiln, carries out evacuation of the space in kiln, and exhausts the air between the aforementioned glass substrates, It consists of a process which makes a discharge gas intervene between the aforementioned glass substrates by supplying a discharge gas to the aforementioned space in kiln, and a process which seals both glass substrates by the sealing agent prepared in the periphery of the aforementioned glass substrate by carrying out the temperature up of the inside of the aforementioned kiln to predetermined temperature. In invention of a claim 4, pressurization to the glass substrate at the time of sealing is performed in the aforementioned claim 3 by making it higher than the pressure of the discharge gas which enclosed kiln internal pressure between glass substrates.

[0006]

[Embodiments of the Invention] Below, the 1st gestalt of operation of this invention is explained. First, conventionally similarly, surface glass-substrate A which prepared the electrode and the septum in the opposite side, and tooth-back glass-substrate B are attached in the installation device 1 installed in sealing kiln T, and are located in sealing kiln T. As the aforementioned installation device 1 is shown in drawing 2 , two or more setters for tooth-back glass substrates 3 are being fixed to four slide guides (only front two have appeared drawing) 2 at the predetermined spacing. Moreover, the upper part of each setter for tooth-back glass substrates 3 is equipped with the setter for surface glass substrates 4 free sliding of a slide guide 2]. And it is fixed to the drive rod 5 at the same spacing as the aforementioned setter for tooth-back glass substrates 3, and each setter for surface glass substrates 4 can move up and down with the drive rod 5. On the other hand, the aforementioned drive rod 5 penetrates the head lining section of the kiln mainframe 10 through the bellows vacuum sealing device 6, and moves up and down according to the ball screw device 8 rotated by the motor 7.

[0007] Moreover, while the lower part of the kiln mainframe 10 is connected through the evacuation equipment and the change-over valve V1 which are not illustrated by piping 11, in kiln, piping 12 penetrates the lower part of the kiln mainframe 10, and is prepared, and this piping 12 is connected to the bomb 13 of an electric discharge chemical cylinder (Ne), for example, neon, an argon (Ar), or a xenon (Xe) through the change-over valve V2. Moreover, inside [kiln] the aforementioned piping 12, two or more branch-pipe 12a is prepared.

[0008] Since it consists of the aforementioned configuration, sealing kiln T opens the insertion door (not shown) of sealing kiln T (status of drawing 1), applies the sealing agents 20, such as a crystalline low melting glass, to the periphery section of the aforementioned opposite side of the aforementioned tooth-back glass-substrate B, makes an opposite side the upper part and attaches this tooth-back glass-substrate B in the setter for tooth-back glass substrates 3 of the aforementioned installation device 1. On the other hand, surface glass-substrate A carries out the opposite side caudad, and equips the setter for surface glass substrates 4 with it.

[0009] In addition, a breakthrough is prepared in an insertion door side like the conventional thing in the inner direction from the application fraction of the sealing agent 20 of the aforementioned tooth-back glass-substrate B, and the chip spool 21 which is open for free passage to the aforementioned opposite side through this breakthrough is beforehand attached by the high sealing agent of melting temperature from the aforementioned sealing agent 20, and this chip spool 21 has penetrated the setter for tooth-back glass substrates 3.

[0010] Next, if both the glass substrates A and B are attached in the installation device 1 as mentioned above, it will set so that the chip spool 21 may be connected to each branch-pipe 12a of piping 12, the aforementioned motor 7 may be driven and predetermined opening x (0.1-0.2mm) may be formed between both glass-substrates A and B. Then, an insertion door is closed, while the inside of kiln is heated at 300-400 degrees C at the heater not to illustrate, the inside of kiln is exhausted with evacuation equipment, using a change-over valve V1 as open, and the degasifying of both the glass substrates A and B is performed simultaneously. In addition, the aforementioned change-over valve V2 is close. In this case, the programming rates of kiln are 5-15 degrees C / min, and exhaust air is about 10-6 to 10 to 7 Torrs. Moreover, in order to perform the aforementioned degasifying still certainly, to about 300-400 degrees C near the sealing agent softening point, the temperature up of both the glass substrates A and B may be carried out, and they may carry out a fixed time soaking hold after that.

[0011] If the inside of kiln is made into a predetermined degree of vacuum and the degasifying from the exhaust air in kiln and both the glass substrates A and B is completed as it is the above Heat the inside of kiln further and raise 400-500 degrees C which is the melting temperature of the sealing agent 20, and drive a motor 7, drop the drive rod 5, surface glass-substrate A is made to stick by pressure on tooth-back glass-substrate B, both the glass substrates A and B are sealed in this sticking-by-pressure process, and it considers as a panel. If a sealing process is completed as mentioned above, inert gas, such as N2 gas, will be supplied in kiln, and glass substrates A and B will be cooled with the cooling rate

of 1-10 degrees C/min.

[0012] After the aforementioned cooling process completion, while a change-over valve V1 is made close, specified-pressure (400 - 760Torr) enclosure of the discharge gas is carried out into each panel from piping 12 and the chip spool 21, using a change-over valve V2 as open. In this case, since the inside of a panel serves as the vacuum, enclosure of a discharge gas is also performed extremely for a short time (drawing 4). A tube diameter is extracted and stopped, it considers as a predetermined [******] plasma display panel, opening the insertion door of sealing kiln T and carrying out melting of the chip spool 21 by the burner etc., if enclosure of the discharge gas into the aforementioned panel is completed, and each panel is taken out out of kiln.

Technique

[Description of the Prior Art] Although various technique is proposed as the manufacture technique of a plasma display panel, there are the following as a typical thing. That is, the chip spool which is a glass tube for air supply and exhaust as open for free passage [first, while an electrode etc. is prepared in each opposite side of a surface glass substrate and a tooth-back glass substrate, a breakthrough is prepared in the lateral part of a surface glass substrate, and / with the aforementioned breakthrough] on the front face of this glass substrate is attached. And it is one [at least] opposite side of both the aforementioned glass substrates, and sealing agents, such as a low melting glass, are applied outside the aforementioned breakthrough. Then, both are fixed with restricted fixtures, such as a clip, in piles so that the electrode of both glass substrates may be countered and intersected perpendicularly, and by carrying out heating melting of the sealing agent at sealing kiln, the sealing unification of both the aforementioned glass substrates is carried out, and it considers as a panel.
[0003] While an air-supply-and-exhaust spool is next connected to the chip spool of the panel which carried out aforementioned] sealing unification, this air-supply-and-exhaust spool is opened for free passage possible [changeover to the bomb for discharge gases, and a vacuum pump], and it inserts in exhaust air kiln, and while the aforementioned panel is heated, evacuation of each interior of a panel is carried out to a predetermined degree of vacuum with a vacuum pump, and a degasifying is performed. Then, a discharge gas (Ne), for example, neon, an argon (Ar), xenons (Xe), or these mixed gas is enclosed with the interior of a panel to about 400-600 Torrs. If the aforementioned enclosure work finishes, a panel will be extracted from exhaust air kiln, the aforementioned chip spool will have been stopped, and it will consider as a predetermined plasma display panel.

[Translation done.]

Effect

[Effect of the Invention] Since a degasifying is planned when a surface glass substrate and a tooth-back glass substrate heat the whole under predetermined temperature with a predetermined opening in advance of sealing by the above explanation according to invention of claims 1 and 2 so that clearly, short, degasifying time can carry out certainly and can raise a productivity so much. Moreover, since it is not what performs enclosure of the exhaust air and the discharge gas between glass substrates by change of a kiln internal pressure force control and a furnace atmosphere, and also performs enclosure of the exhaust air and the discharge gas between glass substrates through a narrow clearance according to invention of a claim 3, a purge timing and discharge-gas enclosure time can make unnecessary about [that productive efficiency can be short made very high] or a chip spool, and do so the effect of being cheap. Furthermore, like invention of a claim 4, if both glass substrates are sealed by the pressure differential of kiln internal pressure and the pressure between glass substrates, the sticking-by-pressure force becomes uniform and the opening between glass substrates can be easily made into the inside of default value. Moreover, also in invention [which], since processing kiln can be managed with one kiln, its installation cost is also so cheap.

[Translation done.]

* NOTICES *

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2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, although it continues after sealing processing of both glass substrates at the evacuation inside a panel and enclosure work of a discharge gas is performed in the aforementioned conventional technique 100-200 micrometers [in which the aforementioned interior of a panel is substantially formed by the mating face of both glass substrates] since it is very a slit and a less than 100-200-micrometer septum exists in this opening (space), The exhaust air for a degasifying took time very much, and while the productivity was very bad, it had the technical probrem that exhausting became inadequate and the discharge-gas purity inside a panel became low.
Therefore, the 1st purpose of this invention is offering the manufacture technique of the plasma display which can exhaust the interior of a panel for a short time (degasifying). Moreover, by the aforementioned conventional technique, while the chip spool is required, you have to attach this chip spool in a surface glass substrate with a sufficient precision.
Furthermore, the air-supply-and-exhaust spool which connects to a vacuum pump etc. the restricted fixture and the aforementioned chip spool which fix a surface glass substrate and a tooth-back glass substrate is also needed. That is, by the aforementioned technique, much time is needed for installation of about [needing many members] or these members, connection, etc. Therefore, the 2nd purpose of this invention is offering the manufacture technique of the plasma display which solves the aforementioned technical probrem by moreover enclosing the exhaust air inside a panel, and the discharge gas inside a panel very easily for a short time.

[Translation done.]

MEANS

[Means for Solving the Problem] To this invention, the manufacture technique of such a plasma display panel In order to attain the aforementioned purpose, in invention of a claim 1 The process which piles up a surface glass substrate and a tooth-back glass substrate so that it may have a predetermined spacing and the electrode may counter and intersect perpendicularly, The process which this piled-up glass substrate is located in kiln, and carries out evacuation of the inside of the concerned kiln under predetermined temperature, It consists of the process which carries out the temperature up of the inside of the concerned kiln to sealing temperature, and seals both glass substrates, a process which cools the inside of kiln and cools both glass substrates after glass-substrate sealing, and a process which supplies and encloses a discharge gas from the chip spool attached in the glass substrate of one of the above after the completion of cooling. The process which piles up a surface glass substrate and a tooth-back glass substrate in invention of a claim 2 so that it may have a predetermined spacing and the electrode may counter and intersect perpendicularly, The process which this piled-up glass substrate is located in kiln, and heats the inside of the concerned kiln in an inert atmosphere following on the evacuation under predetermined temperature, The process which carries out the temperature up of the inside of the concerned kiln to sealing temperature, and seals both glass substrates, and the process which cools the inside of kiln and cools both glass substrates after glass-substrate sealing, It consists of a process which carries out evacuation from the chip spool which attached the space between glass substrates in the glass substrate of the above [either], and a process which supplies a discharge gas from the aforementioned chip spool, and is enclosed in the aforementioned space. The process which piles up a surface glass substrate and a tooth-back glass substrate in invention of a claim 3 so that it may have a predetermined spacing and the electrode may counter and intersect perpendicularly, The process which this piled-up glass substrate is located in sealing kiln, carries out evacuation of the space in kiln, and exhausts the air between the aforementioned glass substrates, It consists of a process which makes a discharge gas intervene between the aforementioned glass substrates by supplying a discharge gas to the aforementioned space in kiln, and a process which seals both glass substrates by the sealing agent prepared in the periphery of the aforementioned glass substrate by carrying out the temperature up of the inside of the aforementioned kiln to predetermined temperature. In invention of a claim 4, pressurization to the glass substrate at the time of sealing is performed in the aforementioned claim 3 by making it higher than the pressure of the discharge gas which enclosed kiln internal pressure between glass substrates.
[0006]
[Embodiments of the Invention] Below, the 1st gestalt of operation of this invention is explained. First, conventionally similarly, surface glass-substrate A which prepared the electrode and the septum in the opposite side, and tooth-back glass-substrate B are attached in the installation device 1 installed in sealing kiln T, and are located in sealing kiln T. As the aforementioned installation device 1 is shown in drawing 2 , two or more setters for tooth-back glass substrates 3 are being fixed to four slide guides (only front two have appeared drawing) 2 at the predetermined spacing. Moreover, the upper part of each setter for tooth-back glass substrates 3 is equipped with the setter for surface glass substrates 4 free sliding of a slide guide 2]. And it is fixed to the drive rod 5 at the same spacing as the aforementioned setter for tooth-back glass substrates 3, and each setter for surface glass substrates 4 can move up and down with the drive rod 5. On the other hand, the aforementioned drive rod 5 penetrates the head lining section of the kiln mainframe 10 through the bellows vacuum sealing device 6, and moves up and down according to the ball screw device 8 rotated by the motor 7.
[0007] Moreover, while the lower part of the kiln mainframe 10 is connected through the evacuation equipment and the change-over valve V1 which are not illustrated by piping 11, in kiln, piping 12 penetrates the lower part of the kiln mainframe 10, and is prepared, and this piping 12 is connected to the bomb 13 of an electric discharge chemical cylinder (Ne), for example, neon, an argon (Ar), or a xenon (Xe) through the change-over valve V2. Moreover, inside [kiln] the aforementioned piping 12, two or more branch-pipe 12a is prepared.
[0008] Since it consists of the aforementioned configuration, sealing kiln T opens the insertion door (not shown) of sealing kiln T (status of drawing 1), applies the sealing agents 20, such as a crystalline low melting glass, to the periphery section of the aforementioned opposite side of the aforementioned tooth-back glass-substrate B, makes an opposite side the upper part and attaches this tooth-back glass-substrate B in the setter for tooth-back glass substrates 3 of the aforementioned installation device 1. On the other hand, surface glass-substrate A carries out the opposite side caudad, and equips the setter for surface glass substrates 4 with it.
[0009] In addition, a breakthrough is prepared in an insertion door side like the conventional thing in the inner direction

from the application fraction of the sealing agent 20 of the aforementioned tooth-back glass-substrate B, and the chip spool 21 which is open for free passage to the aforementioned opposite side through this breakthrough is beforehand attached by the high sealing agent of melting temperature from the aforementioned sealing agent 20, and this chip spool 21 has penetrated the setter for tooth-back glass substrates 3.

[0010] Next, if both the glass substrates A and B are attached in the installation device 1 as mentioned above, it will set so that the chip spool 21 may be connected to each branch-pipe 12a of piping 12, the aforementioned motor 7 may be driven and predetermined opening x (0.1-0.2mm) may be formed between both glass-substrates A and B. Then, an insertion door is closed, while the inside of kiln is heated at 300-400 degrees C at the heater not to illustrate, the inside of kiln is exhausted with evacuation equipment, using a change-over valve V1 as open, and the degasifying of both the glass substrates A and B is performed simultaneously. In addition, the aforementioned change-over valve V2 is close. In this case, the programming rates of kiln are 5-15 degrees C / min, and exhaust air is about 10-6 to 10 to 7 Torrs. Moreover, in order to perform the aforementioned degasifying still certainly, to about 300-400 degrees C near the sealing agent softening point, the temperature up of both the glass substrates A and B may be carried out, and they may carry out a fixed time soaking hold after that.

[0011] If the inside of kiln is made into a predetermined degree of vacuum and the degasifying from the exhaust air in kiln and both the glass substrates A and B is completed as it is the above Heat the inside of kiln further and raise 400-500 degrees C which is the melting temperature of the sealing agent 20, and drive a motor 7, drop the drive rod 5, surface glass-substrate A is made to stick by pressure on tooth-back glass-substrate B, both the glass substrates A and B are sealed in this sticking-by-pressure process, and it considers as a panel. If a sealing process is completed as mentioned above, inert gas, such as N2 gas, will be supplied in kiln, and glass substrates A and B will be cooled with the cooling rate of 1-10 degrees C/min.

[0012] After the aforementioned cooling process completion, while a change-over valve V1 is made close, specified-pressure (400 - 760Torr) enclosure of the discharge gas is carried out into each panel from piping 12 and the chip spool 21, using a change-over valve V2 as open. In this case, since the inside of a panel serves as the vacuum, enclosure of a discharge gas is also performed extremely for a short time (drawing 4). A tube diameter is extracted and stopped, it considers as a predetermined [******] plasma display panel, opening the insertion door of sealing kiln T and carrying out melting of the chip spool 21 by the burner etc., if enclosure of the discharge gas into the aforementioned panel is completed, and each panel is taken out out of kiln.

[0013] In addition, as shown in drawing 1 , it connects with evacuation equipment (not shown) through the change-over valve V3 at the aforementioned piping 12, enclosure of a discharge gas is preceded, evacuation during the cooling time after the aforementioned sealing process or after the completion of cooling, and of the inside of a panel is carried out further, after that, change-over valves V2 and V3 may be switched, and a discharge gas may be supplied. If you do in this way, let the enclosure discharge gas in a panel be what has more high purity.

[0014] Below, the 2nd gestalt of operation is explained. In the 1st gestalt of the aforementioned implementation, although the case where degasifying processing and exhaust air processing of glass substrates A and B were performed simultaneously was shown, you may be made to perform the aforementioned degasifying processing and exhaust air processing at another process. In this case, as shown in drawing 1 , the inactive chemical cylinders 14, such as N2 gas, are connected to piping 11 through the change-over valve V4, glass substrates A and B are heated, inserting in each glass substrates A and B in sealing kiln T like the above-mentioned, and carrying out evacuation of the inside of kiln with evacuation equipment, and a degasifying is performed. Then, using a change-over valve V4 as open using a change-over valve V1 as close, N2 gas etc. is supplied to near the atmospheric pressure in kiln, and like the above-mentioned, glass substrates A and B are sealed and it considers as a panel. And evacuation of the inside of a panel is carried out with evacuation equipment during a cooling time or after the completion of cooling, using a change-over valve V3 as open, after that, change-over valves V2 and V3 are switched, and a discharge gas is enclosed in a panel.

[0015] In addition, although the case where attached the chip spool 21 in tooth-back glass-substrate B beforehand, and it inserted in in kiln in the gestalt of each aforementioned implementation was explained By forming the chip spool 21 in surface glass-substrate A, installation with the chip spool 21 and the glass substrates A and B includes the sealing agent 20 in the installation section of the chip spool 21 and the glass substrates A and B, and may seal it simultaneously at the time of heating of the sealing process of glass substrates A and B. Furthermore, it heats at temperature lower than sealing temperature beforehand, and you may dry and temporary baking of glass substrates A and B, the sealing agent 20, etc. may be carried out. In this case, out gas decreases, the contamination in kiln is mitigated, and while the purity of a furnace atmosphere can be raised, the stability of sealing improves.

[0016] Below, the 3rd gestalt of operation is explained. Discharge gases, such as for example, neon gas, are introduced in kiln from the electric discharge chemical cylinder 15 during soaking of the meantime or after that, using [raise 400-500 degrees C which the inside of kiln will be further heated if the inside of kiln is made into a predetermined degree of vacuum and the degasifying from the exhaust air in kiln and both the glass substrates A and B is completed like the 1st gestalt of the aforementioned implementation, and is the melting temperature of the sealing agent 20, and] a change-over valve V4 as open using a change-over valve V And if the introduction in kiln of a discharge gas and heating of both the glass substrates A and B are completed, surface glass-substrate A is made to stick by pressure on tooth-back glass-substrate B like the above-mentioned, and a discharge gas will be enclosed at the same time it pressurizes and panel-izes both the

glass substrates A and B in this sticking-by-pressure process. In this case, the chip spool 21, the piping 12, etc. are unnecessary.

[0017] In addition, since temperature of a discharge gas is high, it is more desirable than the last finish pressure (the time pressure of ordinary temperature) to carry out to one about 2.4 times the pressure of a pressure in the hyperbaric pressure, for example, the temperature of 450 degrees C, at the time of ordinary temperature (drawing 5). As it is the above, if a discharge gas is enclosed in a panel, it will cool with the cooling rate of 1-10 degrees C/min.

[0018] Moreover, it supports by the piece 22 of supporting material which dissolves both the glass substrates A and B at an elevated temperature from the sealing agent 20 in the 3rd gestalt of the aforementioned implementation as shown in drawing 3 , for example, the low melting glass to which mixture composition was changed a little. You may enclose a discharge gas in a panel at the same time it presses both the glass substrates A and B for kiln internal pressure as a pressure higher than the pressure in a panel, after dissolving the piece 22 of supporting material at a sealing process (400-500 degrees C), sealing both the glass substrates A and B and considering as a panel. In this case, each setter for tooth-back glass substrates 3 in the installation device 1 only needs to attach in a slide guide 2 free [sliding].

Furthermore, although batch processing explained with each gestalt of the aforementioned implementation, a glass substrate is located in a muffle, and this muffle is conveyed continuously or intermittently and it may be made to process it in kiln.

[Translation done.]

* NOTICES *

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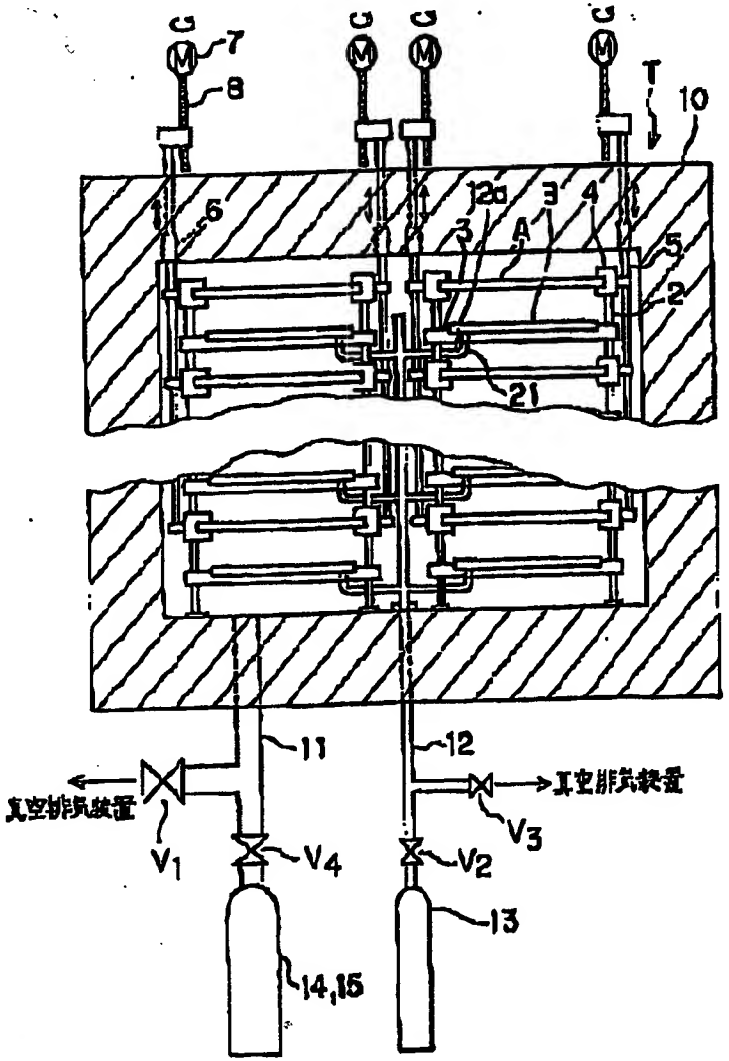
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The cross section of the sealing kiln used for this invention.
[Drawing 2] Explanatory drawing of the installation device of drawing 1 .
[Drawing 3] Drawing showing the status before other sealing of a glass substrate.
[Drawing 4] The graph which shows the relation between each process of this invention, the temperature in kiln, kiln internal pressure, and panel internal pressure.
[Drawing 5] The graph which shows the relation between each process of this invention, the temperature in kiln, and kiln internal pressure.
[Description of Notations]
1 [-- An electric discharge chemical cylinder, 20 / -- A sealing agent, 21 / -- A chip spool, 22 / -- The piece of supporting material, A / -- A surface glass substrate, B / -- A tooth-back glass substrate, T / -- Sealing kiln.] -- An installation device, 10 -- A kiln mainframe, 13, 15

[Translation done.]

【図1】 FIG. 1



【図2】 FIG. 2

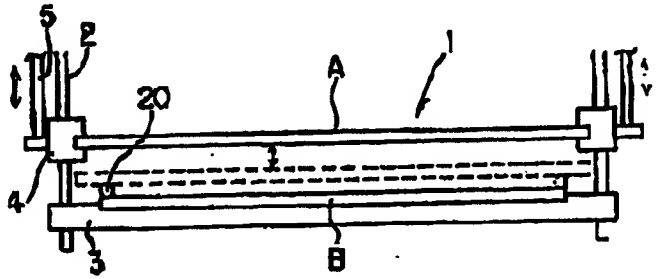


FIG. 3

【図3】

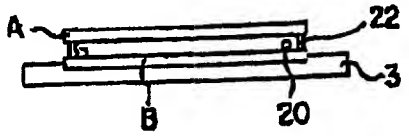
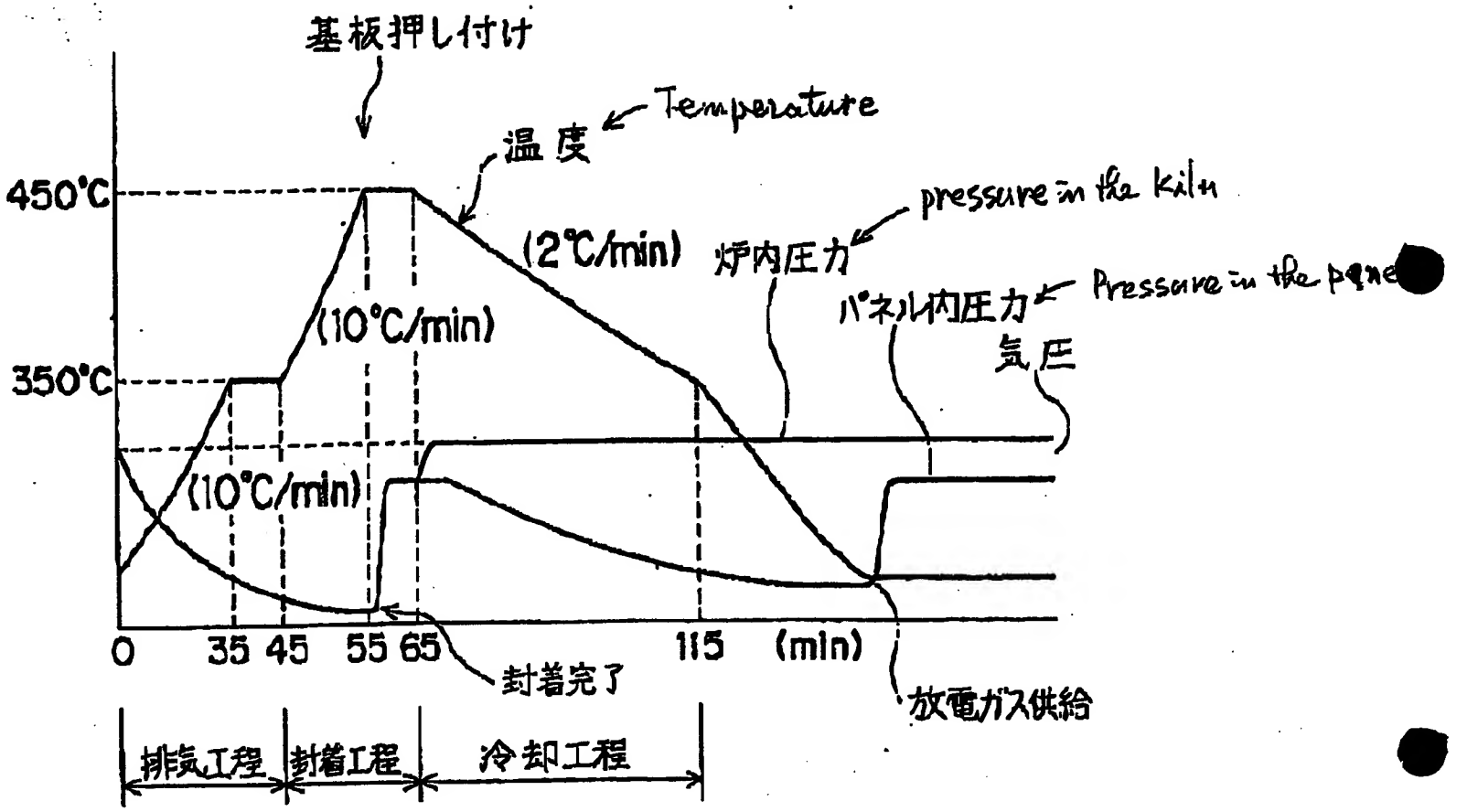
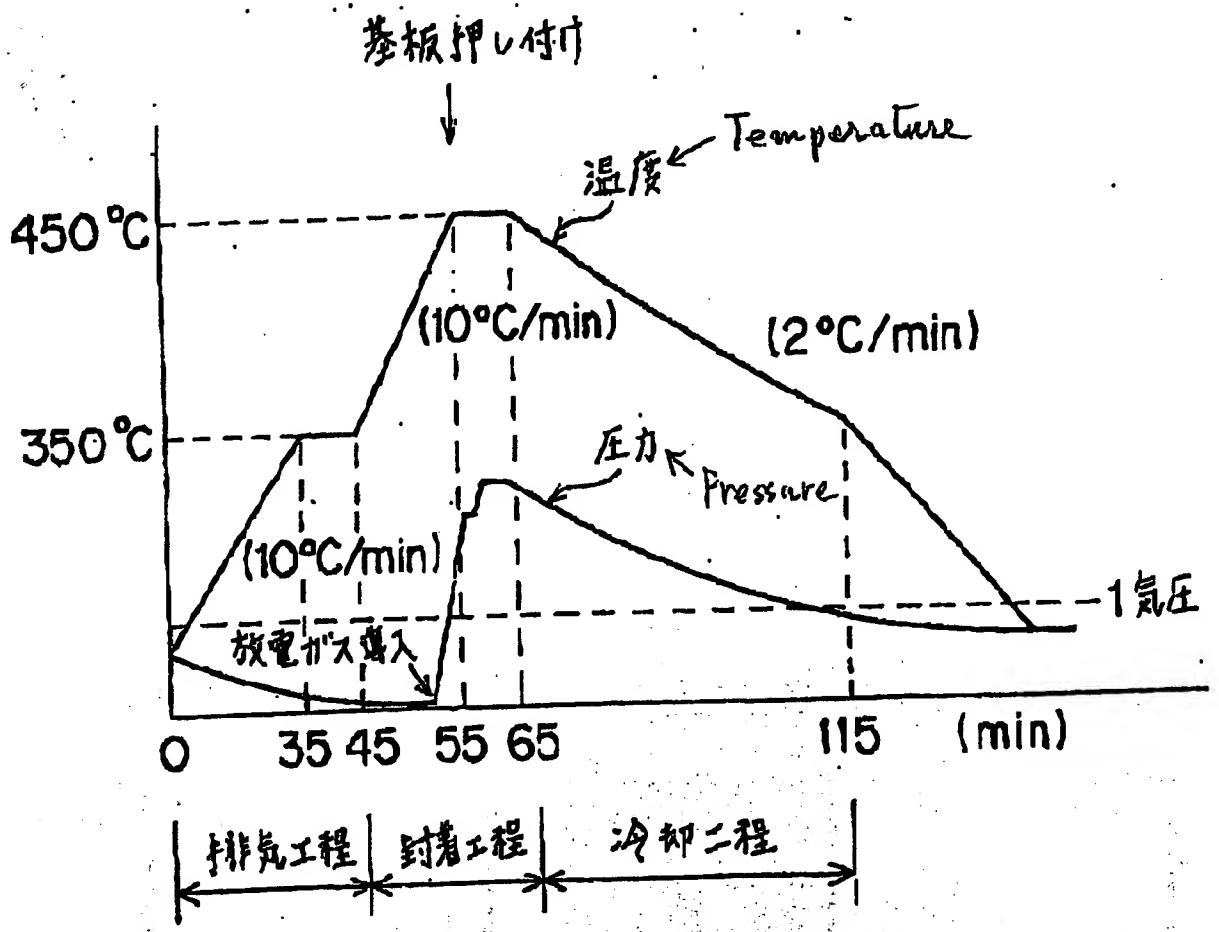


FIG. 4

【図4】


基板押し付け
温度
Temperature
450°C
350°C
(10°C/min)
(2°C/min)
炉内圧力
pressure in the kiln
パネル内圧力
Pressure in the panel
気圧
(10°C/min)
0
35
45
55
65
115
(min)
封着完了
放電ガス供給
排気工程
封着工程
冷却工程

【図5】 FIG.5


基板押し付け
温度 Temperature
450℃
350℃
(10℃/min)
(2℃/min)
圧力 Pressure
(10℃/min)
1気圧
放電ガス導入
0
35 45 55 65
115
(min)
排気工程
封着工程
冷却二程